MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

EEN1026 – ELECTRONICS II

(TE/ RE)

06 MARCH 2018
2:30 PM – 4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 6 pages including cover page with 4 Questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a)Explain briefly;

(i) Why a power amplifier must have large power and high efficiency?

(ii) Why class-B amplifier has a conduction angle of 180^0?

(iii) Why in class-A amplifier current flowing through a transistor is half of its saturation current?

[2+2+2 marks]

(b) The circuit operation of an ideal class-B amplifier with complementary symmetry is shown in **Figure Q1(b).** Assume V_{CC}=15 V and R_L=10 Ω. Determine

(i) The maximum signal output power.

(ii) The corresponding dc input power dissipation and conversion efficiency.

(iii) The maximum power dissipation of each transistor.

[1.5+2+5.5 marks]

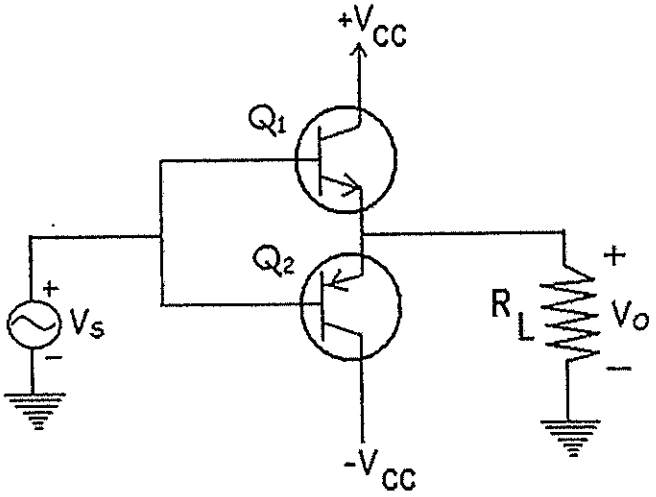

Figure Q1(b)

(c)

(i) Draw the circuit diagram of a transformer coupled class-A amplifier.

(ii) Determine the maximum signal output power it can produce under ideal conditions when a bipolar junction transistor (BJT) with P_D=10 W is used in class-A transformer coupled amplifier.

(iii) Explain, why a transformer is used to couple signal power to the load of class-A amplifier?

[4+4+2 Marks]

Continued...

Question 2

(a) A common-source amplifier is shown in **Figure Q2(a)**. Draw the high-frequency small-signal equivalent circuit model for the amplifier and explain the reason for the addition of parasitic capacitances in the transistor model.

[6 Marks]

(b) Apply the Miller's theorem to the circuit in part (a) and draw the equivalent circuit.

[5 Marks]

(c) Prove that the upper cutoff frequency at the input and output circuits are:

$$f_{Hi} = \frac{1}{2\pi R_{Ti} C_{Ti}} \quad and \quad f_{Hi} = \frac{1}{2\pi R_{Ti} C_{Ti}}$$

where,

$R_{Ti} = r_s \,//\, R_G$

$R_{To} = r_d \,//\, R_d \,//\, R_L$

$C_{Ti} = C + C_{gd}\,(1 - A_V)$

$C_{To} = C_{gd}\,(1 - 1/A_V) + C_{ds}\,A_V = v_{ds}/v_{gs}$

[8 Marks]

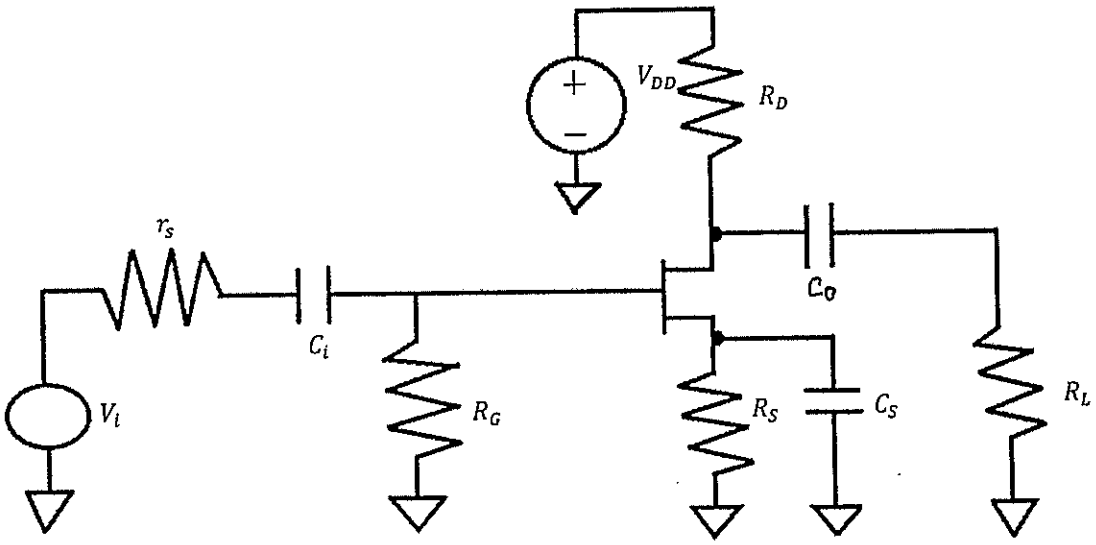

Figure Q2(a)

(d) Calculate the upper cutoff frequency for the amplifier. Given that r_s = 50 Ω, R_G = 30 kΩ, r_d = 20 kΩ, R_D = 4 kΩ, R_L = 1 kΩ, g_s = 3 pF, C_{gd} = 2 pF, C_{ds} = 0.5 pF and A_V = -7.

[6 Marks]

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Question 3

(a) (i) Discuss the operation of the circuit as shown in **Figure Q3 (a).** Also, draw its transfer characteristics.

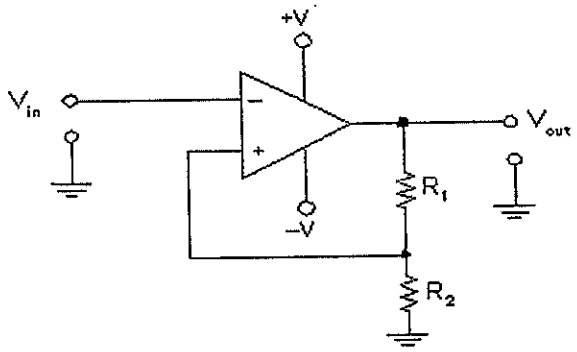

Figure Q3 (a)

[4+4 Marks]

(ii) How the transfer characteristics will be changed if lower part of the resistance R_2 in **Figure Q3(a)** is connected with power supply V_{CC} instead of ground.

[4 Marks]

(b) (i) Implement an astable multivibrator using two monostable multivibrators.
(ii) How an astable multivibrator can produce asymmetrical square-waveform?
(iii) Modify circuit of Figure Q3(a) to implement the analog astable multivibrator.

[4+1+3 Marks]

(c) A 555 timer is connected for astable operation as shown in **Figure Q3 (c).** The values of the components are; R_1=10 KΩ, R_2=2.3 KΩ and C=0.1 μF. For V_{CC}=12 V, determine
(i) Output frequency
(ii) Duty cycle and
(iii) Average power dissipated

[1.5+1.5+2 Marks]

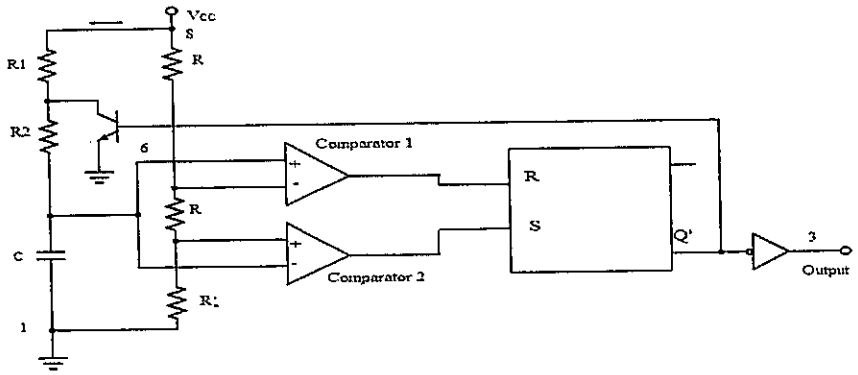

Figure Q3(c)

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Question 4

(a) With proper labels, sketch the transfer characteristics for a

(i) depletion MOSFET [2 Marks]

(ii) enhancement MOFET [2 Marks]

(b) **Figure Q4(b)** shows a n-channel JFET biased with a voltage divider circuit. It is given that the voltage at the drain is 9 V and the I_{DSS} = 8 mA. Find the pinch-off voltage V_P.

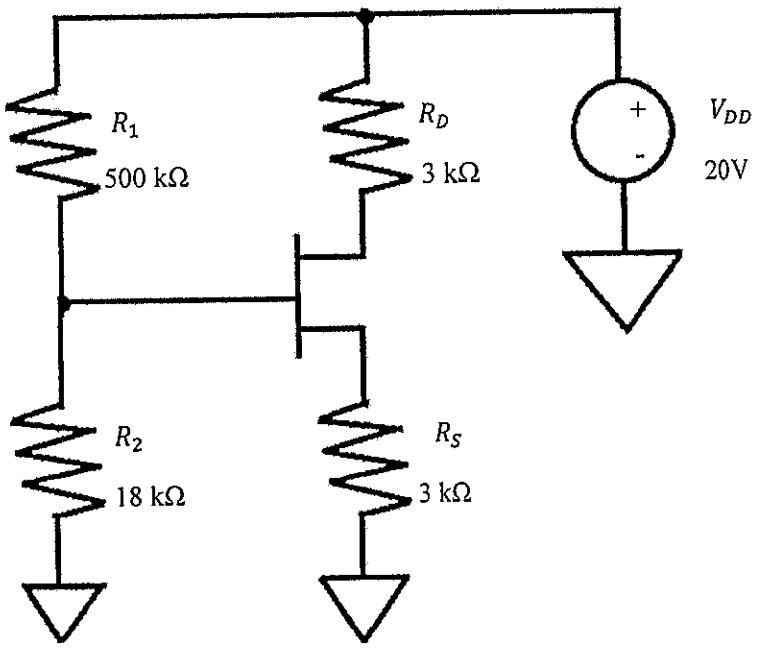

Figure Q4(b) [5 Marks]

(c) The self-bias configuration in **Figure Q4(c)** has the operating point defined by V_{GSQ} = -1.96 V and I_{DQ} = 2.88 mA. Given that gate-source cutoff voltage is -4.5 V and I_{DSS} = 9 mA. The drain resistance of the n-channel JFET is given as r_d = 20 Ω.

Continued...

(i) Draw a small-signal equivalent circuit model for the network in **Figure Q4(c)**. Note that the coupling and bypass capacitors are sufficiently large at the operating frequency such that they can be represented by short circuit for small-signal.

[5 Marks]

(ii) Determine the forward transconductance, g_m.

[3 Marks]

(iii) Calculate the input impedance, Z_i.

[2 Marks]

(iv) Calculate the output impedance, Z_o.

[3 Marks]

(v) Calculate the voltage gain, A_v.

[3 Marks]

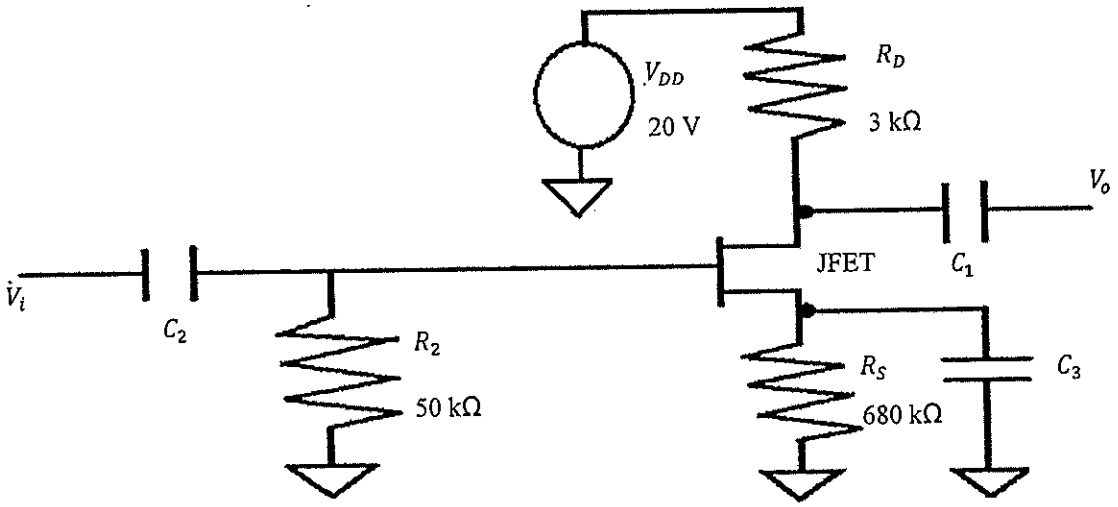

Figure Q4(c)

End of paper.